

IRRITABLE HEART OR EFFORT SYNDROME.

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THE medical work incidental to the selection of men for our new armies has brought new problems and novel experiences for all engaged in it, even for those who by reason of years of service in civil or military hospitals might justly consider themselves familiar with the various fields of clinical medicine. Especially is this true with relation to the physical signs and phenomena of heart affections. Not indeed that anything essentially new has been discovered, but rather that the methods employed, applied as they have been to many thousands of men called from civil life to the Colors, have brought new appreciation of the extent to which certain physical defects or disturbances prevail among our people and have compelled us to study these conditions from an entirely new view-point, that of the acceptability of the subject of such disabilities for military service. The problem has concerned prognosis rather than diagnosis, and its solution has been hedged about with anxiety, both for the welfare of the individual concerned and for the soundness and vigor of our armies.

To rightly value the facts set forth in this report certain considerations must be borne in mind. In the first place the men summoned for military service must have been subjected to most careful and repeated physical examinations. It is doubtless true that no army in the world has been put through so many tests to assure the physical soundness of its personnel. The men of the National Guard were not only examined by their regimental surgeons before being mustered into the Federal service, but were also gone over, man by man, by experts in the diagnosis of diseases of the heart and lungs. The drafted men were examined at the place of their enrollment and again at the camp to which they were assigned. In the case of any suspicion of disability they underwent a third examination at the hands of specialists in the particular field concerned. Finally, in all the camps during the past six or seven months, boards of specialists in tuberculosis have been engaged in going over the forces, man by man, for disease of the heart or lungs. In consequence of these methods it may safely be assumed that few indeed of the recruits presenting any abnormality of heart sound or action have escaped observation. As a corollary the numbers of those found or believed to be suffering from disease or disturbance of the heart has been impressively large.

The problem of the disposition of these cases has been one of the most difficult with which the army medical staff has had to deal. Their numbers made it a matter of importance that they should not be released from service without sound grounds for that action, and yet they could not be held without anxiety as to what the future might develop with regard to their suitability for service, especially in the event of their being sent overseas. The gravity of these questions has forced upon those concerned the most careful restudy and restatement of the criteria of both organic and functional heart affections and the most painstaking application of the conclusions to the individual case.

In this difficult undertaking we have had, as in all our preparations for this great war, the invaluable aid of the experience of the nations now our allies, and especially that of the British and Canadian armies. The results of that experience are embodied in the "Reports upon Soldiers Returned as Cases of 'Disordered Action of the Heart,' " or "Valvular Heart Disease," published under the auspices of the British Medical Research Committee. This report summarizes the work of a large group of investigators and covers, in a comprehensive manner, the whole subject of cardiac affections in relation to military service. From it has been taken the caption under which Dr. Thomas Lewis prefers to designate the particularly interesting group of cases previously described as "Cardiac Palpitation" or "Irritable Heart," which has been made the subject of our study.

The affection is by no means a new one. During our Civil War it was observed and studied thoroughly by Da Costa. The reader of his scholarly article¹ will at once see that he is dealing, in general, with the same class of cases that we are meeting today. Moreover, he finds some reference to the affection in the British reports on the Crimean War and very justly surmises that it has always prevailed among soldiers, but has heretofore escaped detection by reason of the difficulties of distinguishing it from organic lesions of the heart.

Da Costa gives the "general clinical history" of a considerable number of his cases as follows:

"A man who has been for some months or longer in active service would be seized with diarrhea, annoying, yet not severe enough to keep him out of the field; or if attacked with diarrhea and fever he rejoined, after a short stay in the hospital, his command and again underwent the exertions of a soldier's life. He soon noticed that he could not bear them as formerly; he got out of breath, could not keep up with his comrades; was annoyed with dizziness and palpitation and with pain in the chest; his accoutrements oppressed him, and all this though he appeared well and healthy. Seeking advice from the surgeon of his regiment it was decided that he was unfit for

¹ Irritable Heart, *Am. Jour. Med. Sc.*, January, 1871.

duty, and he was sent to a hospital where his persistently quick-acting heart confirmed his story, though he looked like a man in sound condition. Any digestive disturbances which might have existed gradually passed away, but the irritability of the heart remained, and only very slowly did the excited organ return to its natural condition; or it failed to do so, notwithstanding the use of remedies which control the circulation; thus the case might go on for a long time and the patient, after having been the round of hospitals, would be discharged, or, as unfit for active duty, placed in the Invalid Corps."

With the exception that diarrhea or any other digestive disturbance is a rare antecedent, the above clinical picture is fairly representative of the condition as we have observed it.

In like manner his description of the symptoms and physical signs of the affection, both remarkably painstaking and accurate, for the most part, fit the conditions as we find them. His data being necessarily limited to the results of physical examination and clinical observation, without the instruments of precision whose use of recent years has added so much to our knowledge of the affections of the heart, he had included in his groups certain cases which we would now place in other categories. There are, for example, a few cases of auricular fibrillation and some also of probable myocarditis and cardiac hypertrophy. The great majority of his cases, however, appear to be identical with those presented in this report.

It is true, also, that Da Costa, though he notes in some instances that the disability had existed prior to the enlistment, and also states that he could parallel his observations among the soldiers with cases from private practice, nevertheless regards the affection as peculiarly related to the military life. One would infer that whatever examination was made before the acceptance of a recruit at that time it was not adequate to bring out the defect. In consequence this was discovered only when some acute illness or unusual exertion aggravated the disturbance and rendered the soldier unfit for duty. The careful medical supervision given our new armies brings out the fact that many of the recruits have this disturbance at the time of their reception and, as is pointed out in the present report, have had it for some years before their entry into the service. It therefore belongs to the soldier's life only in the sense that the physical exertions required of him, or the hardships or illnesses incident to his occupation, bring it to the fore.

The query naturally arises why, if this be true, the subject has received so little attention in clinical medicine since the publication of Da Costa's paper, and only the calling of great numbers of men to military service has again brought it into prominence and made it the subject of thorough study. The explanation would appear to be that, under the ordinary conditions of civil life, men suffering from this disability early become conscious that they are unequal

to heavy or exhausting physical labor and betake themselves to some form of occupation for which they are competent. In this way they make the best of the matter and get along tolerably well until such time as the disturbance in its natural course passes off. They only comparatively rarely present themselves for study or treatment and their affection under ordinary conditions receives scant attention. One may search the works of Babcock, Broadbent, Brockbank, Brunton, Hart, Mackenzie, Morison and even Lewis (until the report already referred to) without finding mention of the work of Da Costa or appreciation of the importance of the subject. In Hoover's article on "Irritable and Weakened Heart"² there is a paragraph devoted to Da Costa's observations.

In our present war conditions the subject becomes one of importance. In every camp one will find numbers of men suffering from this disorder under observation and study to determine the propriety of holding them for military service. No small part of the rejections for physical disability among the new recruits are made for this reason. For example, one-fifth of the rejections for cardiac complaints in Camp Dix up to February 1, 1918, had been made on this ground. In the exigencies of the present situation it was thought best to release many men from the service, although it was regarded as possible that by proper handling some of them might in time have been rendered fit. Efforts along these lines are now being made. It is therefore highly important to understand, as thoroughly as possible, the problem these patients present. The study embodied in this report was made to the end of increasing our knowledge of the condition and enabling us more effectively to deal with it.

While it has not been practicable to install the electrocardiograph in the base hospitals, the sphygmomanometer, the polygraph and the roentgen rays have been available and have been freely used. With these aids to accurate diagnosis and the knowledge which recent intensive study of diseases of the heart has made common property we approach the differentiation of functional and organic affections of the heart with confidence, and in dealing with these patients we feel reasonably certain that careful study will enable us to exclude the presence of organic lesions and, in our handling of them, avoid doing them harm.

The observations herein reported were made upon cases sent to the cardiac consultant for office examination, not for observation in the hospital wards. This series includes most of the severer cases met with, but many of the milder cases have not been recorded here. In some instances only a single examination has been made; many of the cases have been seen twice and a number three or four times, the findings on subsequent examinations being practically identical

² Osler: Modern Medicine.

with those at the first visit. No case was diagnosed as of this type which presented any definite evidence of organic heart disease, and pulmonary tuberculosis, general neurasthenia and the tachycardia immediately following a febrile affection were carefully excluded. It was found very difficult to exclude hyperthyroidism, but when this diagnosis seemed reasonably certain it was made. Many of these cases were referred by the regimental surgeons for advice as to diagnosis and disposition; some were referred by the Board of Examiners for Tuberculosis, some by the Disability Board and a few by the ward surgeons of the Base Hospital. They were variously diagnosed as effort syndrome, chronic myocarditis, cardiac dilatation, simple tachycardia and valvular disease with poor compensation.

Occupation. A. Indoor occupations predominate.

Indoor	33 cases.
Outdoor	17 "

B. Little difference was noted as to whether sedentary, light or heavy work was engaged in.

Sedentary	14 cases.
Light	23 "
Heavy	13 "

Da Costa attributed no influence to the preceding occupation, remarking only that "painters, butchers, blacksmiths, carpenters, the city-bred man who had left his desk in the counting-house and the farmer fresh from tilling the fields were all fully represented in the long list of sufferers."

On the other hand the British Commission reports that of 543 instances in which this point was investigated, 57 per cent. were from light or sedentary occupations, 20 per cent. from moderately heavy employments and 23 per cent. from heavy work. They discuss these data in the following terms:

"The incidence is extraordinarily heavy among men engaged in indoor and sedentary work before the outbreak of the war. This fact may be accounted for in several ways: A large percentage of the patients were affected by the condition in civil life and years before joining the army; of these many had been forced to adopt sedentary occupations and had given up heavier work earlier in life because of their unfitness for it. The condition is commonest among civilians, often precluding heavy work; usually it does not preclude sedentary work or light work; affected civilians therefore tend to drift into these employments, and once they are so employed they are able to carry on with some slight degree of discomfort or they may be entirely free of symptoms. A history of each kind is common. Thus the men frequently relate that they were well once sedentary work was adopted, but they were unable to engage in outdoor games or exercises. But it is equally clear that a more considerable number

entered sedentary occupations for other reasons. Of these some became aware that they were unfit for violent exercise at a later date; others had never so tested themselves and the symptoms of these often date from the earliest days of training. It is unquestionable that many men recruited from sedentary occupations were affected by the condition before joining, although previous to that event in their life-history symptoms had never presented themselves. The question naturally arises as to what extent sedentary work actually predisposes to the affection; no conclusive answer can be returned from the data at our disposal, though they strongly suggest sedentary work as a predisposing cause. The incidence of infective disease among clerks is heavy.

"To what extent training may rid men of a predisposition to or early manifestations of the condition is also uncertain; not a few patients have related that symptoms, previously experienced, disappeared early in training to return later on active service, but the number of men who enjoy a similar early experience and endure active service without recurrence of the symptoms is unknown.

"The facts now brought forward strongly suggest that, were it possible, it would be wise in conscripting men from sedentary occupations to arrange a more thorough initial medical scrutiny and subsequently to train such as are passed for service by tenderer methods in the initial stages than those in vogue for conscripts as a whole.

"The class of military invalid with which we are dealing is a very large one; it is a very unsatisfactory one on the score of expense and time lost in training and in hospitals. It cannot be too strongly emphasized, therefore, that more than half of this class is drawn from sedentary or light occupations."

1. *Previous Disease.* Inquiry elicited the following data:

Measles	34 cases.
Rheumatism	16 "
Scarlet fever	11 "
Tonsillitis	14 "
Pertussis	9 "
Pneumonia	4 "
Diphtheria	6 "
Typhoid fever	5 "
Appendicitis	2 "
Other infections	3 "
No disease	7 "

While at first sight these figures would suggest a very direct and intimate relation between some preceding infection and the effort syndrome-complex, more careful study did not bear out this inference. The attempt was made in every instance to ascertain what the patient considered was responsible for the onset of his trouble, but in only 8 of the 50 cases could a definite cause be assigned. In 6 of these acute infection was regarded as the exciting cause, diphtheria

in 3 cases, pneumonia, rheumatism and bronchitis 1 each. The other cases started from a mental shock, 1 from the sudden death of a parent and 1 after being told at an examination for insurance that his heart was weak.

Remembering that our data refer to men examined at the very beginning of their service it is of interest and importance to compare them with those derived from men longer in service. From Da Costa the following table of antecedent conditions is taken:

ANALYSIS OF 200 CASES

Fevers (typhoid and typhomalarial)	17.0 per cent.
Diarrhea (typhoid and typhomalarial)	30.5 "
Hard field service, excessive marching	38.5 "
Wounds, injuries, rheumatism, scurvy, ordinary duties of the soldier's life and doubtful causes	18.0 "

The findings of the British Commission may be summarized thus: In 182 of a total of 558 patients examined the symptoms of the affections were first noted during convalescence from some acute infection, that is, in 33 per cent. of the cases. After further consideration of their observations they conclude that these figures by no means represent the full truth, but that in at least 50 per cent. to 60 per cent. of the cases infectious disease may be held to play the chief part in promoting the disease in its initial stages.

ANALYSIS OF 182 CASES.

Rheumatic fever or chorea	68 cases or 12 per cent. of total 558
Dysentery	14 cases or 2.5 per cent.
Typhoid fever and diarrhea	14 cases or 2.5 per cent.
Pneumonia, pleurisy and bronchitis	25 cases or 4.4 per cent.
Fever or influenza	28 cases or 5.0 per cent.
Diphtheria, scarlet fever and pus infections	33 cases or 6.0 per cent.
	33.0 per cent.

The role assigned to rheumatic fever in this tabulation is impressive, but they add that of the remaining 376 patients those in whom no close relation between the infectious disease and the disorder could be established at least 65 definitely belonged in the rheumatic class, although the precise significance of rheumatism in relation to the malady is in many of them uncertain.

Grouping all these observations it appears clear that no one infectious disease, or type of infection, is to be regarded as having an essential relation to the affection. During the Civil War it was the fevers and diarrheas, then prevalent, that were accused; among the British troops rheumatic fever comes to the fore, just as it does in all their health studies; with us it will doubtless prove to be infections of another type.

During the past winter we have had frequent opportunities in the

wards of the hospital to observe the influence of intercurrent acute infections in patients already subject to this affection. Under these conditions the disturbance is aggravated, convalescence is protracted and not infrequently the symptoms have become so severe, and persistent as to lead to the discharge of the patient from the service.

2. *Shock.* No little interest attaches to the two cases in which the onset of the affection was attributed to mental shock, in one case the sudden death of a parent, in the other the alarm caused by the patient's being told at an examination for life insurance that his heart was weak. If the affection were a pure neurosis one would certainly expect that such experiences would play a much larger part in the causation. From the British report we learn that of their 558 cases but 13 (2 per cent.) dated the onset from shell shock or mine explosion, and that in two of this small number of cases duty was carried on until an infection sufficiently aggravated the symptoms to warrant invaliding. It would therefore appear that of the two factors antecedent infection is the much more effective in inducing the disturbances of which these patients complain.

Duration of Symptoms. Perhaps the most important finding in our own study lies in the fact that in all but one of the fifty cases the patient had suffered from cardiac symptoms for some time previous to entering the army, although in most of the cases the trouble had been aggravated by army training. Of considerable interest from the view-point of prognosis is the question of the length of time during which the disturbance had existed before the soldier's enrolment. In our series this was as follows:

Under 1 year	2 cases.
1 to 5 years	30 "
Over 5 years	12 "
Indeterminate	6 "

Without doubt the longer the condition has existed the longer the treatment required to restore the subject to normal, the more remote the prospect of ultimate success and the greater the likelihood that even if recovery occurs any new strain or new infection will cause a return of the symptoms and in the end lead to the discharge of the recruit.

Since these chronic or long-standing cases are those we at present have to deal with in our camps, and it is of the utmost importance to us to determine, so far as we may, the outlook for them and their ultimate value to the military service, it may be well to quote at length a page of the British report dealing with these problems:

"Taking all patients invalided, symptoms of the condition were present in 43 per cent. at the time the men joined the service (average duration of symptoms, nine years); 12 per cent. acquired their first symptoms on training and 45 per cent. on active service.

"Of men in whom the symptoms are acquired before joining, the

duration of training added to the stay in hospitals averages 11.3 months; the total duty performed on foreign service (light and full) averages 3.9 months. In those in whom the onset is on training the average total of training and stay in hospitals is 12.3 months; the total duty performed on foreign service averages 2.9 months. The smaller amount of foreign service completed by the men in whom the onset is on training is due to the fact that only 46 per cent. of them have seen foreign service, while of those in whom the onset was before joining 63 per cent. have seen foreign service.

"From these figures it might appear that those who have symptoms on joining are more favorable, from the military stand-point, than those who develop symptoms on training. But this conclusion is not borne out by the analysis of the categories of discharge from the hospital, for of the former 36 per cent. return to duty (10 per cent. in the full-duty category) while of the latter 52 per cent. return to duty (32 per cent. in the full-duty categories). When the onset of symptoms is on training the condition is more acute and for the moment somewhat more incapacitating, but the recovery is more rapid and more satisfactory.

"The group in which the onset is on active service a group in which the duration of symptoms is but a few months do best of all; of these 60 per cent. return to duty (35 per cent. in the full-duty categories).

"To sum up: where the disability is of long duration it is relatively mild during the initial stages of training and service; a large percentage of these men see active service abroad. But if the condition changes for the worse in these men, recovery is slower and more unsatisfactory than in those in whom a similar degree of disability has arisen more recently."

In the light of these facts it would seem questionable policy to permit any of these men who have had their disability for years before entering the army to be sent abroad; they should, at any rate, not be regarded as fit for full duty.

Other Etiological Factors. Tea and Coffee. Inquiry failed to reveal anything of significance in this relation. Seven of the fifty men used none at all, a rather remarkable return, since coffee is so regularly regarded as an essential of the soldier's diet. But one man used more than three cups of coffee during the day. Doubtless this moderation or dislike is determined largely by the results of experience, in that the men find they are more comfortable without this particular form of stimulation.

Tobacco. In view of the widespread tendency to lay the responsibility for any cardiac rapidity or irregularity at the door of Lady Nicotine, careful inquiry was made as to the use of tobacco: 7 of the 50 did not use it at all; 23 smoked very moderately; 14 used from ten to twenty cigarettes a day; 6 only admitted smoking more than twenty daily. Again, there is little question that this moderation is

dictated by experience, but it leaves no ground for assuming that tobacco plays any part of consequence in the production of the malady. The British Commission reports a like conclusion from their investigation of this subject and also quotes McGregor to the effect that the condition is as frequently found among the Sikhs, who are non-smokers, as among the other races in their armies.

Alcohol. Still more remarkable are the replies to questions on this point, tabulated as follows:

To excess	4 cases.
Moderate	21 "
Abstainers	25 "

Similarly in the British study of 454 cases 52 per cent. were total abstainers. Self-protection against unpleasant results of indulgence is probably in part responsible for this restraint, but there are doubtless many other factors. Many of the men are abstainers by conviction; many of them do not now use alcohol because it is not easily to be had. In Camp Dix intoxication was practically unknown except in the case of newly drafted men. While alcohol certainly aggravates the symptoms in these patients its use is not an important factor in the causation. This fact is rather curiously enforced by the figures in the British report, which show that in these "effort syndrome" cases return to duty are much more frequent among the heavy drinkers than among the abstainers. Relieved of the injury done by alcohol they make a more satisfactory recovery than the abstainers, who present no such *point d'appui* to therapeutics.

Symptoms. Dyspnea and precordial pain were almost constant symptoms and one or the other was given as the chief complaint in nearly all the cases. The results of our study may be shown thus:

	Present.	Absent.	Predominating.
Dyspnea on exertion	50	0	18
Pain	48	2	19
Exhaustion	43	7	4
Giddiness of fainting	47	3	1
Palpitation	49	1	8
Orthopnea or smothering at night	17	33	0

Nervousness. The patients were questioned as to whether they considered themselves nervous, and answered as follows: Very nervous, 23; somewhat, 16; slightly, 8; not at all, 3.

A glance at the table shows clearly the constancy of the characteristic symptoms. The studies both of Da Costa and the British investigators have brought out many interesting details of the several symptoms, but for our present purposes the above enumeration suffices.

Physical Signs. Heart Rate. This was taken (1) three or four minutes after the patient had entered the examining room and while he was still standing; (2) after he had been lying supine for two or

three minutes; (3) after exercise consisting in all cases in jumping up and down on one foot one hundred times. Rate per minute was here estimated on the count for the first ten seconds after the exercise was completed; (4) rate per minute estimated on a ten-second period counted one minute after exercise was completed; (5) a similar count three minutes after the completion of the exercise. It was found that there was a difference of more than fifteen beats per minute in 24 cases and less than ten beats per minute in only 12 cases. There was well-marked delay in the fall of the rate after exercise in 22 cases.

	120 per minute or over.	100 to 120.	Under 100.
Standing	19	21	10
Dorsal	4	19	27
After exercise, 1 minute	36	9	5
After exercise, 3 minutes	22	6	

Immediately after the exercise the pulse rate was tabulated thus:

	150 per minute or over.	130 to 150.	Under 130.
	25	21	4

The abnormal response to simple exercise is well shown in these tables, especially the persistence of rapidity beyond the normal period of recovery (two minutes).

Blood-pressure. This was uniformly taken with the patient sitting upright and always before exercise.

Systolic blood-pressure over 140	32 cases.
Diastolic blood-pressure over 100	7 "
Pulse-pressure over 60	16 "

The systolic blood-pressure therefore tends to be slightly higher than normal, but this rise rarely exceeds 170 mm. The diastolic pressure shows less tendency to rise above the normal than the systolic and the rise is usually less. The pulse-pressure occasionally exceeds the normal limits. In other words, while there is a tendency to modifications of the blood-pressure relations the changes in pressure are not sufficient to be of moment.

Size of Heart. This was estimated by the palpation of the apex impulse and percussion of the borders. Slight hypertrophy was noted in 19 cases; in 36 the results were normal. Meakins and Gunson report observations of peculiar interest along this line. They find the size of the heart, determined by the orthodiagram, to be normal in these cases, but they also find that in these patients exercise acts exactly as in normal individuals, confirming the findings of de la Camp, Moritz, Nicolai and Zuntz that the heart is smaller than before. These observations seem to dispose finally of the hypothesis that these soldiers are suffering from heart-strain, the results of overexercise, and that this strain has induced dilatation of the heart.

Irregularity of the Pulse. Extrasystoles were observed in 1 case, sinus arrhythmia in 9 cases and none at all in 40. It is in this category that the recent advances in the knowledge of cardiac affections enables us to work much more surely than was possible in Da Costa's day. We can say with assurance that the irregularities observed were of practically no importance and should not influence us in judging the functional efficiency of the heart or the propriety of holding the subject for service.

Deep tenderness to percussion over the apex region. This was present in 21 cases and absent in 19. Precordial areas of skin hyperesthesia were likewise present in 21 cases and absent in 19. The British Commission find that hyperalgesia is an important sign in these patients, those who have it to a notable degree showing a low capacity for work and a correspondingly poor prognosis.

Murmurs. These were observed as follows:

Systolic at apex	16 cases.
Systolic at base	2 "
Cardiorespiratory	3 "
None	20 "

None of the murmurs heard was considered as due to organic valvular disease.

It is, of course, true that there is little harmony as to what would constitute reliable criteria for a final distinction between functional and organic murmurs. In the early stages of the work these patients were regularly sent for examination with the diagnosis of mitral insufficiency or other valvular lesion. In judging the character of a murmur the history (especially of previous rheumatism), the size and action of the heart, pulse frequency and quality, blood-pressure, the location and quality of the murmur and the response to exercise were all taken into account. No part of the work of the British Commission is more striking than their conclusions as to the value of cardiac murmurs in estimating the efficiency of the heart. These are so important as to warrant their being quoted in full:

"Cardiac Murmurs. When a soldier presents the characteristic low-pitched rumbling murmur in diastole and at the apex beat, or when an early diastolic murmur, maximal at the level of the second costal cartilage, is associated with the water-hammer pulse, then, by common consent, he is unfit for duty. Instances of systolic murmurs at base or apex cannot be similarly treated. In the absence of other disqualifying signs or symptoms it is wise to entirely neglect such murmurs in soldiers. This conclusion is at variance with much current teaching and the reasons for insistence upon it are therefore given in full.

"(a) Systolic murmurs at base or apex indicate valvular disease only exceptionally; there is no conformity of opinion to the character or conduction of systolic murmurs indicating valvular lesion.

"(b) The extent of mitral valve damage which produces a systolic murmur alone is relatively slight; the disease is often limited to the valve, the heart muscle, which is the essential part of the organ, being wholly undamaged.

"(c) Patients who are invalided on the ground of systolic murmurs alone are subsequently found when tested to be fit for service in nearly all instances. A large number of men who present such murmurs are known to have passed the most severe ordeals of active service without accident.

"(d) If a group of patients who present no murmurs and a similar group in whom systolic murmurs exist are tested in respect to their capacity for work or active service no difference is to be found in the capacity of the two groups.

"The estimate of fitness or unfitness for service can be gauged with considerable accuracy without reference to such murmurs; as soon as murmurs of systolic time are taken into consideration the issue becomes confused."

Accentuation of the First Sound and Diffusion of the Apex Beat. The first sound was accentuated in 31 cases; in 11 the apex impulse was diffuse. The first sound was normal, with no diffusion of the apex beat in 16 cases. Diffusion of the apex beat and a forcible impulse have long been regarded as indications of hypertrophy, but the orthodiagrammatic studies made under the British Commission show them to be unreliable either as indications of the size of the heart or of its functional capabilities.

Erben's Sign. This consists in a marked retardation of the pulse-rate, when the patient squats on his heels and bends the head well forward between the knees. The pulse is first counted for fifteen seconds, the patient standing; he then assumes the squatting position and bends the head well forward; the pulse is then counted again for three consecutive five-second periods. This maneuver produces no retardation in cases of tachycardia due to febrile conditions or myocardial disease, but it is usually quite pronounced in the nervous cases. Thus in pulses averaging 120 to the minute or 10 to each five seconds the readings for the three five-second periods immediately following the assumption of this position will run: -5, 6, 7, -6, 7, 8, -6, 6, 6, etc. This phenomenon, sphygmographically demonstrable, is said by Erben to be caused by the stimulation of the pneumogastric produced by reason of the venous congestion of the brain. There are doubtless other factors in the production of the retardation, such as the increased abdominal pressure with pressure on the splanchnic nerves and vessels and possibly the indirect pressure upon the heart itself. Certainly the retardation is greater than that produced by merely lying down or even by having the patient, while lying on a bench, let the head fall as far down ward over the edge of the bench as possible. Whatever the explanation it appears to be a fact that marked retardation in the Erben

position is characteristic of the "effort syndrome" cases, and is not present to the same degree, at least, in tachycardia due to organic disease. The occurrence of this marked retardation in this position has suggested that exercises involving this and similar movements might have special value in the treatment of the condition. This idea it has not yet been possible to try out.

Thyroid Gland. It has already been stated that when the diagnosis of hyperthyroidism seemed warranted it was made and the cases so classified were not included in this present series. Practically the history of the case and the presence or absence of the traditional eye signs of Graves's disease decided the group into which any questionable case should be put. Apart from the cases classed as hyperthyroidism the involvement of the thyroid was found as follows:

Slight general enlargement	11 cases.
Isthmus alone enlarged	7 "
No enlargement	32 "

Some would undoubtedly at once transfer all these cases showing any increase in size of the thyroid to the class of hyperthyroidism. That has not seemed justifiable on clinical grounds. Lewis's observations that feeding thyroid gland to the patients suffering from "effort syndrome," they react, as do normal persons and not after the manner of the hyperthyroids, would appear to settle the debate as to whether all these patients belong in the latter category.

Sweating, cyanosis of the hands and tremor of the fingers were also recorded as follows:

	Slight.	Marked.	Very marked.	Absent.
Sweating	8	25	12	5
Cyanosis of hands	12	21	3	14
Tremor of fingers	15	14	1	20

Again, these symptoms would by the radical be regarded as determining the diagnosis in the cases in which they are present, but they occur so often quite apart from any other evidence of involvement of the thyroid gland that we have been cautious as interpreting them in that sense.

Knee-jerks. The observations on this point were made with the thought that these reflexes are usually a reliable index of the tonus of the nervous system. There was a markedly exaggerated response in only 4 of the cases, a slight exaggeration in 24 and a normal response in 22 cases.

Condition of Tonsils and Teeth. In these days of tireless zeal in the search for original foci of infection no inquiry is complete without reference to the integrity of these parts. The teeth were reported as good in 31 cases, fair in 8 and bad in 11 cases.

The tonsils were found small in 30 cases, slightly hypertrophied in 10 and greatly hypertrophied in 10 cases.

Needless to say it should be regarded as of first importance to see that such handicaps as diseased teeth or tonsils should be removed, although it is not probable that such treatment will be followed by any appreciable change in the pulse rate or other symptoms in these patients.

Nature of the Affection. This is still a moot question. Da Costa regarded it as an irritability of the heart, maintained by a disordered nervous system, but could go no further in his explanation of the symptoms. In the light of our present conceptions of physiology and pathology some suggest hyperthyroidism, others increased adrenal activity as the explanation of the phenomena. Bacteremia has been suggested but not proved. Reviewing these various opinions the British Commission inclines to the belief that the disturbance may be a chronic toxemia or disturbance of metabolism, the result possibly of a previous infection, but find many difficulties in frankly committing themselves to this hypothesis. It may fairly be said that we at present have no knowledge of the causations of the disease which determines clearly the therapeutic measures to be applied to it. As the results of his experience Da Costa put special value upon rest and digitalis. The British Commission find both these measures useless and possibly harmful. They advocate progressive physical training and lay out a carefully graded system of exercises through which the patients are passed. We have as yet no sufficient experience of our own and must for the present follow the lines of procedure laid down as the result of their careful study of many hundreds of cases. It may only be surmised that Da Costa's conclusion in favor of rest and digitalis sprang from the fact that he had included among his cases a sufficient number of instances of auricular fibrillation to influence his judgment of the entire group. He notes that digitalis failed of effect in many cases.

The inferences drawn from this study may be summarized as follows:

1. The irritable heart or effort syndrome cases constitute a symptom-complex rather than a definite disease. It seems clear there is no definite disease of the heart, and we agree with Lewis that it is highly desirable to avoid any terminology which suggests that there is.
2. The affection is not peculiar to soldiers but often precedes entry into service, though it may be exaggerated or in some cases produced by the active exercise or vicissitudes of the military life.
3. Occupation in civil life is as much a result as a cause of the disturbance, in that men who know their weakness usually adopt an employment suited to it.
4. In the great majority of cases no definite cause of the disorder is ascertainable. When such can be found it is most often an acute infection.

5. Tobacco, alcohol, coffee and tea, though possible causes of aggravation of the symptoms, cannot be regarded as prime factors in the causation.

6. Hyperthyroidism is suggested in some of the cases, but if present it is in a mild degree, and there seems no valid ground for regarding it as more than a contributory factor.

7. In the light of the experience now available in the studies of Da Costa and the British Commission it would seem wise to retain many of these patients in the hope of rendering them fit for duty of some kind. In view of their very limited usefulness in foreign service they should not be sent abroad.

8. For the present, at least, the line of treatment must be that of progressive physical training as laid down by the British Commission, which, even if it fails to produce satisfactory therapeutic results offers the best means of classifying the men as to their physical ability to perform military service.

**CLINICAL REPORT UPON CASES OF LOBAR PNEUMONIA
TREATED WITH ANTIPNEUMOCOCCUS SERUM AS
OBSERVED AT GENERAL HOSPITAL NO. 6, FORT
MC PHERSON, GEORGIA, OCTOBER, 1917,
TO MAY, 1918.**

BY LIEUT.-COLONEL C. N. B. CAMAC, M.C., U.S.A.,
NEW YORK.

This report deals especially with cases which were diagnosed clinically, bacteriologically and by postmortem as lobar pneumonia due to the pneumococcus. Reference is made to cases which were given antipneumococcus serum but which at autopsy were shown not to be lobar consolidation. There are added also cases of infection with streptococcus hemolyticus, but these are included by way of contrast only, our conclusion being that cases of pneumococcus infection present clinical features quite different from those of streptococcus infection. Streptococcus may be, and frequently is, superimposed upon the pneumococcus or may occur separately. Whether separate or in conjunction with the pneumococcus we believe that the clinical features are differentiable in the majority of cases.

We have looked upon the mixed infections as similar to the complicating infection of pyogenic organisms in typhoid or smallpox. Moreover, we have felt that bronchopneumonia should not be considered as having anything to do with lobar pneumonia any more than the tuberculous ulcer of the intestine should be considered in connection with typhoid ulcer except to show the difference. The pneumococcus infection of whatever type when treated at the outset